

February 8, 2004

**REQUEST FOR PROPOSALS
Bay Area Traffic Operations System (TOS) Application Development
Letter of Invitation**

Dear Consultant:

The Metropolitan Transportation Commission Service Authority for Freeways and Expressways (MTC SAFE), in cooperation with the California Department of Transportation (Caltrans District 4), invites your firm to submit a proposal to provide application development and consulting services for the Bay Area Traffic Operations System (TOS) project.

This letter, together with its enclosures, comprises the Request for Proposal (RFP) for this project. Proposals should be submitted in accordance with the instructions set forth in this RFP.

Proposal Due Date

Interested firms must submit six (6) hard copies of their proposals by 4:00 p.m., Thursday, March 11, 2004. ***Proposals received after that date and time will not be considered.*** A submitted proposal shall be considered a firm offer to provide the services described for a period of ninety (90) days from the date of submittal.

MTC SAFE Point of Contact

Proposals and all inquiries relating to this RFP shall be submitted to:

Sze Lei Leong
MTC SAFE Contract Manager
Metropolitan Transportation Commission
Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, CA 94607-4700
(510) 817-3203
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<sleong@mtc.ca.gov>

Background

The Metropolitan Transportation Commission Service Authority for Freeways and Expressways (MTC SAFE) is a public agency established in 1988, pursuant to California Streets and Highways Code Sections 2550 *et seq.* The purpose of the enabling legislation was to establish a county elected and locally managed motorist-aid call box program in the San Francisco Bay Area, funded by users through a \$1 surcharge on vehicle registration. The legislation created an oversight role for the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). This legislation was later amended to allow MTC SAFE funds to be used for other roadway service programs.

The legislation has facilitated the management, operation and maintenance of freeway-related projects between MTC SAFE and Caltrans. The Traffic Operations System (TOS) is one such project, where MTC SAFE and Caltrans will cooperate in completing this asset management system. This system is intended to provide information on the status of various freeway field equipment pieces (described further in *Appendix A-1, Existing TOS Surveillance Architecture*), which is necessary to provide complete and reliable traffic data to the Transportation Management Center (TMC).

Substantial resources have been invested in the Caltrans' TOS and TMC. Caltrans District 4 currently maintains its field equipment inventory on multiple platforms, using multiple application programs to manage these records. This situation has led to incomplete or inconsistent information, resulting in misidentified or incomplete traffic data being provided to the TMC and other users. In 2001, Caltrans Headquarters Office of Information Technology (HQ-IT) was requested by the District to develop an enhanced TOS field equipment database to consolidate all of the inventory information. This was implemented using Oracle as per Caltrans IT guidelines. Due to budget constraints, the development of this database was halted after it was approximately 80% complete; however, all of the source code and documentation developed by HQ-IT has been turned over to District 4 staff. For reference, see *Appendix A-2, TOS District 4 Data Schema*, and *Appendix A-3, Sample TOS Field Equipment Input Forms*, showing the 80% of the work that was completed, as per HQ-IT guidelines described in *Appendix A-4, TOS District 4 Requirements and Business Rules*.

Project Objective

The objective of this Project is to develop a complete and accurate asset management system of the field equipment and systems associated with the Caltrans District 4 Bay Area Traffic Operations System (TOS) and Transportation Management Center (TMC) in order to:

- ensure reliability of the TOS / TMC through comprehensive tracking of its components;
- improve cost control of maintenance and operation of the TOS / TMC;
- provide up-to-date status reports to guide future decisions concerning maintenance, operation and development of the TOS / TMC; and
- ensure the system provides the functionality needed by its users, especially in conjunction with the Caltrans District 4 Enterprise Transportation Management System (eTMS), which is currently under development.

Scope of Work, Budget and Schedule

The work scope for this RFP includes three phases as described in *Appendix A, Scope of Work*. Phase I shall commence approximately March 29, 2004 and continue through March 28, 2005, with the possibility of an extension for another six (6) months. At the conclusion of Phase I, MTC SAFE shall, upon the recommendation from the Freeway Management Executive Committee, determine whether to proceed with Phases II and III. If MTC SAFE proceeds with these subsequent phases, it may, at its discretion, either issue a Notice to Proceed to the selected consultant or award the work to another consultant outside the scope of the contract that results from this RFP. The maximum budget for Phase I is \$100,000. No budgets have been set for Phases II and III because these phases are contingent on the recommendations developed under Phase I, and the approval of the MTC SAFE Operations Committee.

Proposer Qualifications

To be considered for this project, the proposer must demonstrate in its proposal the following minimum qualifications:

- At least one project team member who possesses certification as an Oracle 8i or 9i Application Developer;
- Working experience with hardware and software platforms, particularly for medium and large-scale relational database systems (Win2k, Linux, Oracle, SQL2k etc.);
- Working experience with front-end user interface applications to import/export data into and out of relational database applications; and
- Project management and coordination expertise with a systems engineering approach.

Proposer's Conference and Request for Exceptions

A proposers' conference will be held on February 20th, 2004 on the 17th Floor of the Lake Merritt Plaza, Claremont Conference Room, 1999 Harrison Street, Oakland, at 10 A.M.. To receive any addenda to this RFP or written responses to questions that may be issued by MTC SAFE, proposers must attend the proposers' conference or provide written notice to MTC of their interest in submitting a proposal.

Any requests for clarification of or exceptions or revisions to RFP requirements or MTC's contract language must be received by MTC no later than February 27th, 2004 to guarantee response or consideration.

Proposal Evaluation

Proposals will be evaluated in accordance with the evaluation factors listed in Section V of the RFP. MTC SAFE reserves the right to accept or reject any or all proposals submitted, waive minor irregularities in proposals, request additional information or revisions to offers, and to negotiate with any or all proposers. Any contract award will be to the firm that presents the proposal that, in the opinion of MTC SAFE, is the most advantageous to MTC SAFE, based on the evaluation criteria specified in Section V.

Consultant Selection Timetable

Proposer's Conference at <i>Lake Merritt Plaza, 1999 Harrison Street, suite 1700 Oakland, Claremont Conference Room</i>	February 20, 2004; 10 A.M.
Closing date/time for receipt of requests for clarification/exceptions	February 27, 2004; 4 P.M.
Written answers to clarification/exceptions mailed to all proposers	March 3, 2004
Closing date/time for receipt of proposals	March 11, 2004; 4:00 P.M.
Interviews/Discussions (if necessary)	March 23-25, 2004
Best and Final Offers Due (if necessary)	April 1, 2004
MTC SAFE Operations Committee Review	April 9, 2004
Execution of Consultant Contract	April 23, 2004 (approximate)

General Conditions

MTC SAFE will not reimburse any proposer for costs related to preparing and submitting a proposal. Materials submitted by proposers are subject to public inspection under the California Public Records Act (Government Code § 6250 *et seq.*).

The selected proposer will be required to sign a contract with MTC SAFE, the key provisions of which are summarized in Appendix D, Synopsis of Provisions in MTC SAFE's Standard Consultant Agreement. Particular attention should be paid to the insurance requirements. Any objections to the specified coverage levels must be brought to the attention of the Contract Manager on or before the date and time established above for receipt of requests for clarification/exceptions; otherwise compliance with the insurance requirements will be assumed.

Authority to Commit MTC SAFE

Based on an evaluation conducted by a evaluation panel, the Executive Director will recommend a consultant to the MTC SAFE Operations Committee, which will commit MTC SAFE to the expenditure of funds in connection with this RFP.

Thank you for your interest.

Sincerely,

Ann Flemer
Deputy Director, Operations

AF: SLL

REQUEST FOR PROPOSALS

to the

METROPOLITAN TRANSPORTATION COMMISSION
SERVICE AUTHORITY FOR FREEWAYS AND EXPRESSWAYS

for

BAY AREA TRAFFIC OPERATIONS SYSTEM (TOS) APPLICATION DEVELOPMENT

February 8, 2004

Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, CA 94607-4700

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I. BACKGROUND, PROJECT OBJECTIVES AND PROJECT RESPONSIBILITIES

A. Background

The Metropolitan Transportation Commission Service Authority for Freeways and Expressways (MTC SAFE) is a public agency established in 1988, pursuant to California Streets and Highways Code Sections 2550 *et seq.* The purpose of the enabling legislation was to establish a county elected and locally managed motorist-aid call box program in the San Francisco Bay Area, funded by users through a \$1 surcharge on vehicle registration. The legislation created an oversight role for the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). This legislation was later amended to allow MTC SAFE funds to be used for other roadway service programs.

The legislation has facilitated the management, operation and maintenance of freeway-related projects between MTC SAFE and Caltrans. The Traffic Operations System (TOS) is one such project, where MTC SAFE and Caltrans will cooperate in completing this asset management system. This system is intended to provide information on the status of various freeway field equipment pieces (described further in *Appendix A-1, Existing TOS Surveillance Architecture*), which is necessary to provide complete and reliable traffic data to the Transportation Management Center (TMC).

Substantial resources have been invested in the Caltrans' TOS and TMC. Caltrans District 4 currently maintains its field equipment inventory on multiple platforms, using multiple application programs to manage these records. This situation has lead to incomplete or inconsistent information, resulting in misidentified or incomplete traffic data being provided to the TMC and other users. In 2001, Caltrans Headquarters Office of Information Technology (HQ-IT) was requested by the District to develop an enhanced TOS field equipment database to consolidate all of the inventory information. This was implemented using Oracle as per Caltrans IT guidelines. Due to budget constraints, the development of this database was halted after it was approximately 80% complete; however, all of the source code and documentation developed by HQ-IT has been turned over to District 4 staff. For reference, see *Appendix A-2, TOS District 4 Data Schema*, and *Appendix A-3, Sample TOS Field Equipment Input Forms*, showing the 80% of the work that was completed, as per HQ-IT guidelines described in *Appendix A-4, TOS District 4 Requirements and Business Rules*.

B. Project Objective

The objective of this Project is to develop a complete and accurate asset management system of the field equipment and systems associated with the District 4 Bay Area TOS and TMC in order to:

- ensure reliability of the TOS / TMC through comprehensive tracking of its components;
- improve cost control of maintenance and operation of the TOS / TMC;
- provide up-to-date status reports to guide future decisions concerning maintenance, operation and development of the TOS / TMC; and

- ensure the system provides the functionality needed by its users, especially in conjunction with the District 4 Enterprise Transportation Management System (eTMS), which is currently under development.

C. Project Responsibilities

Project responsibilities will be allocated as follows:

Consultant: The selected Consultant shall fulfill all tasks set forth in the Scope of Work.

Team Leader: The Team Leader will act as the point of contact for the Consultant on all contractual aspects of the project.

Contract Manager: MTC SAFE will act as the Contract Manager. The Contract Manager will manage all contractual aspects of the project.

Project Manager: Caltrans District 4 will act as the Project Manager. In coordination with the Contract Manager, the Project Manager will provide logistic and technical guidance and resources for the project.

TDWG: The TOS Data Working Group (TDWG), which consists of the Contract and Project Managers as well as Caltrans District 4 and MTC SAFE staff, will provide day-to-day technical and logistical oversight throughout the course of the project.

FMEC: The Freeway Management Executive Committee (FMEC), which consists of Caltrans District 4 and MTC SAFE management, will provide policy oversight and direction to the TDWG.

II. MINIMUM QUALIFICATIONS

To be considered for this project, the proposer must demonstrate in its proposal the following minimum qualifications:

- At least one project team member who possesses certification as an Oracle 8i or 9i Application Developer;
- Working experience with hardware and software platforms, particularly for medium and large-scale relational database management systems (Win2k, Linux, Oracle, SQL2k etc.);
- Working experience with developing front-end user interface applications to import/export data into and out of relational database applications; and
- Project management and coordination expertise with a systems engineering approach.

III. SCOPE OF WORK AND BUDGET

The Scope of Work for the project is provided in *Appendix A*. The Consultant will be expected to perform all work necessary to complete the work scope. The project will be divided into three phases throughout the course of the contract, with each phase closing with a deliverable to provide guidance for the next phase. Project phases are as follows:

- Phase I- Examine all TOS work completed/uncompleted to date, evaluate desired functionality, and develop a recommended approach for implementation;
- Phase II- implement the approved recommendation, and provide training to Caltrans staff;
- Phase III- provide enhancements and extensions, as needed.

At the conclusion of Phase I, MTC SAFE shall, upon the recommendation from the FMEC, determine whether to proceed with Phases II and III. If MTC SAFE proceeds with these subsequent phases, it may, at its discretion, either issue a Notice to Proceed to the selected consultant or award the work to another consultant outside the scope of the contract that results from this RFP. The maximum budget for Phase I is \$100,000. No budgets have been set for Phases II and III because these phases are contingent on the recommendations developed under Phase I, and the approval of the MTC SAFE Operations Committee.

IV. FORM OF PROPOSAL

Proposers must submit six (6) hard copies of their proposal, by March 11, 2004 at 4:00 P.M. to be considered. Proposal content and completeness are most important. Clarity is essential and will be considered in assessing the proposers' capabilities. Each proposal should include:

A. Transmittal Letter

A transmittal letter signed by an official authorized to solicit business and enter into contracts for the proposer's firm and the name and telephone number of the Team Leader, if different from the signator.

B. Title Page

A title page showing the RFP subject, the name of the proposer's firm, local address, telephone number, name of the Team Leader, and the date.

C. Table of Contents

A table of contents including a clear identification of the material by section and page number.

D. Overview and Summary

This section should clearly convey the consultant's understanding of the nature of the work and the general approach to be taken. It should include, but not be limited to, the following:

1. a summary of the proposed approach for implementing the Project;
2. any assumptions made in selecting the approach.
3. A description of particular challenges anticipated in implementing the proposed approach, including potential problem areas, scheduling bottlenecks, critical path items, and any other potential obstacles to successful and timely completion of this project.

E. Detailed Staffing Plan and Schedule

1. Discuss approach to completing each task and major subtask in sufficient detail to demonstrate a clear understanding of the resources required to complete the project. Describe how you would manage risks to address and overcome the obstacles or challenges identified in D.3 above. Propose any changes to the preliminary schedule in Appendix A.

2. Provide a detailed staffing plan for each task and subtask of the work identified in Appendix A. Identify all staff by name and the specific tasks for which each individual will be responsible.
3. Provide a project management plan that describes the approach to managing resources and maintaining quality results. Include a description of the role of any subcontractors, their specific responsibilities, and how their work will be supervised.

F. Qualifications and References

This section should clearly demonstrate that the proposer meets the minimum qualifications set forth in Section II of this RFP.

1. A description of the proposer's qualifications relative to the four minimum qualifications.
2. A resume for each staff person assigned to the project, summarizing his/her qualifications and experience relevant to this project. Include resumes for key subcontractor personnel, as well.
3. A brief description (one page maximum) of any previous projects similar to the services requested, indicating the project title, timing, budget, sponsoring agency and project manager, and roles played by individuals proposed for this study. The name of the contact person, agency for whom the work was performed, telephone number, and year that the work was done, shall also be included. References may be checked for one or more of the final candidates.
4. A sample of at least one written report comparable to the written deliverables required for this project, prepared by member(s) of the team (identifying the author(s)). One sample only is required, and will be returned after proposal evaluation, upon request.

F. Cost Proposal

The cost proposal should provide a full description of the expected expenditures of funds by cost category for each task described in *Appendix A* under Phase I, not to exceed \$100,000. The budget should include, but not be limited to, a task budget and a line item budget with billing rates.

- The task budget should present a breakdown of hours and expenses by task and subtask identified in the detailed staffing plan developed in response to Section E.2 above. It should identify or refer to key personnel or job descriptions in relation to each task to provide a full explanation of the resources committed to the project.
- The line item budget should present a breakdown of costs by cost categories, including billing rates for key personnel and job classifications. The line item budget should be set forth on the Cost and Price Analysis Form attached hereto as *Appendix B* to this RFP. A line item budget should also be submitted for proposed sub-consultants with contracts estimated to exceed \$25,000.

G. California Levine Act Statement

A signed California Levine Act Statement (*Appendix C*)

V. PROPOSAL EVALUATION

A. Review for General Responsiveness

The Contract Manager, in consultation with the MTC SAFE Office of General Counsel, will conduct an initial review of the proposals for general responsiveness and inclusion of the items requested in Section IV, Form of Proposal. Any proposal that does not include enough information to permit the evaluators to rate the proposal in any one of the evaluation factors listed below will be considered non-responsive. A proposal that fails to include one or more items requested in Section IV, Form of Proposal, may be considered complete and generally responsive, if evaluation in every criteria is possible.

B. Verification of Minimum Qualifications

The Contract Manager and Project Manager will then review responsive proposals to ensure that each proposal meets the minimum qualifications. At a minimum, each proposal must demonstrate the following qualifications:

- At least one project team member who possesses certification as an Oracle 8i or 9i Application Developer;
- Working experience with hardware and software platforms, particularly for medium- and large-scale relational database management systems (Win2k, Linux, Oracle, SQL2k etc.);
- Working experience with developing front-end user interface applications to import/export data into and out of relational database applications; and
- Project management and coordination expertise with a systems engineering approach.

C. Evaluation Factors

Those responsive proposals that meet the minimum qualifications will then be evaluated by a panel of staff representatives from MTC SAFE and Caltrans on the basis of the following evaluation factors, all approximately equal in weight in importance:

- Cost Effectiveness;
- Knowledge and understanding of the purpose and scope of the project;
- Professional expertise and experience, including experience and knowledge of Oracle and its associated front-end user interface applications;
- Knowledge of and expertise with the Caltrans District 4 TOS, including field equipment and communications; and
- Project management and coordination expertise, particularly with respect to managing projects with a systems engineering approach.

Following the initial evaluation, the panel may elect to recommend award to a particular proposer or may enter into discussions with a “short list” of proposers, consisting of those proposers reasonably likely, in the opinion of the panel, to be awarded the contract.

D. Proposer Discussions

The purpose of discussions with a proposer on the “short-list” will be to identify to that proposer specific deficiencies and weaknesses in its proposal and to provide the proposer with the opportunity to consider possible approaches to alleviating or eliminating them. These deficiencies or weaknesses may include such things as technical issues, management approach, cost, or team composition. Discussions may take place through written correspondence (including e-mail) and/or face-to-face during interviews. The proposer’s Team Leader, as well as other key personnel identified by the evaluation panel, will be expected to participate in any interview/discussions.

A proposer on the “short-list” invited to participate in interviews/discussions may also be asked to provide presentation relating to one or more Project requirement. Instructions for such presentations will be provided at the appropriate time.

MTC SAFE reserves the right to not convene oral interviews/discussions and to make an award on the basis of initial proposals.

E. Request for Best and Final Offer

Following the discussions, MTC SAFE will give the proposers on the “short-list” the opportunity to revise their written proposals to address the concerns raised during discussions through issuance of a Request for Best and Final Offer (BAFO). A proposer shall be prepared to submit its BAFO in accordance with the procurement schedule in the letter of invitation. Following receipt of the BAFOs, the evaluation panel will re-evaluate the proposals, as revised, against the evaluation criteria. The evaluation panel will then recommend a proposer to the Executive Director. If approved by the Executive Director, the recommendation will be presented to the MTC SAFE Operations Committee for approval.

VI. GENERAL CONDITIONS

A. Limitations

This RFP does not commit the MTC to award a contract or to pay any costs incurred in the preparation of a proposal in response to this RFP.

B. Award

Any award made will be to the consultant whose proposal is most advantageous to MTC based on the evaluation criteria outlined above.

C. Binding Offer

A signed proposal submitted in response to this RFP shall constitute a binding offer from the proposer to contract with MTC according to the terms of the proposal for a period of ninety (90) days after the proposal due date.

D. Contract Arrangements

The selected proposer will be expected to execute a contract similar to MTC's Standard Consultant Agreement, which is summarized in *Appendix D, Synopsis of Provisions in MTC SAFE's Standard Consulting Agreements*. Particular attention should be paid to the insurance and indemnification requirements. A copy of the standard agreement may be obtained from the Contract Manager. If a proposer wishes to propose a modification to any provision in the standard agreement, any such modifications must be brought to the attention of the Contract Manager on or before the date and time established above for receipt of requests for clarification/exceptions. Failure to submit a proposed modification by the deadline shall be deemed acceptance of the terms and conditions in the Standard Consultant Agreement.

The contract payment terms will be lump sum (firm fixed price) with payment made on the basis of receipt and acceptance of satisfactory deliverables by the Contract Manager.

E. Selection Disputes

A proposer may object to a provision of the RFP on the grounds that it is arbitrary, biased, or unduly restrictive, or to the selection of a particular consultant on the grounds that MTC SAFE procedures, the provisions of the RFP or applicable provisions of federal, state or local law have been violated or inaccurately or inappropriately applied by submitting to the MTC SAFE a written explanation of the basis for the protest:

- no later than five (5) working days prior to the date proposals are due, for objections to RFP provisions; or
- no later than three (3) working days after the date the proposer is notified that it failed to meet minimum qualifications or was adjudged nonresponsive; or
- no later than three (3) working days after the date on which contract award is authorized or the date the proposer is notified that it was not selected, whichever is later, for objections to consultant selection.

Except with regard to initial determinations of non-responsiveness or failure to meet the minimum requirements, the evaluation record shall remain confidential until the MTC SAFE Operations Committee authorizes award.

Protests of recommended awards must clearly and specifically describe the basis for the protest in sufficient detail for the MTC SAFE review officer to recommend a resolution to the Executive Director. At the sole discretion of the MTC SAFE, a protesting proposer may be given additional time, up to five (5) working days, to supplement its protest.

The Executive Director will respond to the protest in writing, based on the recommendation of a

staff review officer. Authorization to award a contract to a particular firm by the MTC SAFE Operations Committee shall be deemed conditional until the expiration of the protest period or, if a protest is filed, the issuance of a written response to the protest by the Executive Director. The decision of the Executive Director may be appealed to the MTC SAFE Operations Committee. The MTC SAFE Operations Committee's decision will be the final agency decision.

F. Public Records

This RFP and any material submitted by a proposer in response to this RFP are subject to public inspection under the California Public Records Act (Government Code § 6250 *et seq.*), unless exempt by law. Proposals will remain confidential until the MTC SAFE Operations Committee has authorized award.

APPENDIX A- SCOPE OF WORK

The selected Consultant shall perform the services described below (shown with approximate work times). MTC SAFE will act as the Contract Manager, and Caltrans will act as the Project Manager. A TOS Data Working Group (TDWG) will provide the day-to-day oversight, and the Freeway Management Executive Committee (FMEC) will provide policy oversight and direction to the TDWG.

PHASE I: (work not to exceed 4 months)

IA) Examine Work-to-Date (approximately 3 weeks)

Critically examine Caltrans' current TOS data asset management process and the work developed to date by HQ-IT, as it relates to current technology and the environment in which it would operate. Attend working meetings and conference calls with the TDWG in connection with gathering necessary resources to examine the development work.

Deliverables:

1. A written report with the following items:
 - An examination of the prior work to assess what has been completed/not completed and to describe the current state of the TOS asset management system; and
 - An evaluation of whether completing the prior work represents a viable approach.
2. An evaluation of the TOS elements data schema (updated 6/25/01), and how it may provide a better understanding of the desired TOS asset management system. Refer to *Appendix A-2, TOS District 4 Data Schema*.

IB) Evaluate Desired Functionality (approximately 6 weeks)

Interview Caltrans and MTC SAFE staff designated by the TDWG to determine desired functionality of the TOS asset management system. Attend working meetings and conference calls with the TDWG in connection with evaluating the desired functionality.

Deliverables:

3. A written report identifying all functional requirements, including:
 - The users of the system and their requirements, so that simplification, aggregation, and/or sharing of the data needs can be achieved to help simplify data storage, access, analysis and reporting;
 - Components of the existing field communications sub-systems necessary to maintain the TOS field elements and to support effective TMC operations;
 - Types of the existing field equipment for which inventory and status information is needed, e.g. CCTV, detector stations, CMS, ramp meters, controllers, cabinets, etc.;
 - Data relationships, fields, forms, and reports;
 - Files to generate eTMS server real-time data and status tables;

- Field communication and power system data for budgeting and billing verification;
 - Field infrastructure data for TOS planning and design;
 - Links to Caltrans Integrated Maintenance Management System (IMMS);
 - Field infrastructure inventory reports for budgeting;
 - Framework for real-time equipment status reports; and
 - Resource allocation reports for management.
4. Building upon deliverable 2, an update to the TOS elements data schema, and how the desired functionality will affect the schema.
 5. An operational schema showing how the data is to be entered, accessed and used by users.

IC) Develop a Recommended Approach (approximately 5 weeks)

Using deliverables 1 through 5, the Consultant shall provide one or more recommended approaches to developing the information management system. These recommendations will address estimated costs, schedules, processes for entering and retrieving data and producing reports, ability to link to other systems, ability to provide real-time equipment status, ability to expand the functionality and size of the database, as well as issues and opportunities. The Consultant shall attend working meetings and conference calls with the TDWG in connection with developing a recommended approach and identifying stakeholder responsibilities.

Deliverables:

6. A draft report, which will allow the TDWG to identify priorities for issues identified in Phase IB.
7. A final written report including the following:
 - recommended approaches to developing the information management system, including costs, schedules, issues and opportunities;
 - Building upon deliverable 4, a revised TOS elements data schema; (if necessary)
 - Building upon deliverable 5, a revised operational schema (if necessary)

Consultant shall present the written report and its recommendations to the members of the TDWG and FMEC. After the FMEC has reviewed the recommendation, the FMEC has the option to adopt/reject/modify the recommendation.

At the conclusion of Phase I, MTC SAFE shall, upon the recommendation from the FMEC, determine whether to proceed with Phases II and III. If MTC SAFE proceeds with these subsequent phases, it may, at its discretion, either issue a Notice to Proceed to the selected consultant or may award the work to another consultant outside the scope of the contract that results from this RFP.

PHASE II: (work not to exceed 6 months)

IIA) Preliminary Work (approximately 2 weeks)

Based upon the adopted recommendation in Phase I, the Consultant shall perform the preliminary design work for the implementation of the TOS information management system.

Deliverable:

8. A written report including the following:
 - Identification of user responsibilities throughout the development of the asset management system;
 - Identification of project milestones during the development phase to provide the users context during which their responsibilities are critical to the completion of the work; and
 - A comprehensive testing plan.

IIB) Development Work (approximately 20 weeks)

The Consultant shall perform the work necessary to implement the TOS asset management system. This work shall be performed at the Consultant's work site using the Consultant's equipment.

IIC) Acceptance Testing (approximately 2 weeks)

Once the development work has been completed, the Project Manager will provide access to the workstation on which the database will reside. This workstation is located at the Caltrans District Office, 111 Grand Avenue, Oakland CA, and is accessible to the Consultant Monday through Friday from 8:00 AM to 4:30 PM (excluding legal holidays). The Consultant will use this workstation for data entry, integration testing, and acceptance testing (as described below) only; all software development, including modifications deemed necessary as a result of any testing performed by the Project Manager, shall be performed at Consultant's work site using the Consultant's equipment. Tests shall be performed as specified in the test plan developed in Phase IIA.

Prior to the start of the acceptance testing, the Project Manager will provide a data set representing a sample of the total field equipment inventory, which shall be entered into the database by the Consultant as part of this contract. The Project Manager shall perform a validation of the sample data after it has been entered.

Once the Project Manager has completed the validation of the sample data set, the Consultant shall commence testing. The database shall run continuously without failure of any kind for 10 calendar days; if there is any software failure, the Consultant shall correct said failure, install the corrected database, and re-start the 10-day testing period. During this period, the Project Manager may request any test that he deems necessary to ensure that the software has no apparent bugs. If, at any time, the Project Manager

identifies a failure of the software, the Consultant shall correct said failure, install the corrected database, and re-start the 10-day testing period

Deliverables:

9. Complete database source code with documentation.
10. Database of all failures, bugs, and fixes.

IID) Training (1 week)

Upon successful completion of the acceptance testing, the Consultant shall provide to the Project Manager a proposed schedule for 2 training courses. The first course shall be for Caltrans staff assigned to data entry and modification and shall last 4-8 hours. The Consultant shall provide the instructor for the course, which will be held at the Caltrans District Office. Course materials for 20 students shall be provided.

The second course shall be for Caltrans staff assigned to the administration of the database, including the addition of fields and other schema modifications, and shall last for 20-24 hours over 3 days. The Consultant shall provide the instructor for the course, which will be held at the Caltrans District Office. Course materials for 10 students shall be provided.

Deliverable:

11. Electronic form of course materials for each class.

PHASE III:

IIIA) Enhancements / Extensions (as needed)

Any additional work will be dependent upon the results of Phases I and II.

APPENDIX A-1- EXISTING TOS SURVEILLANCE ARCHITECTURE

Caltrans District 4 Traffic Operations System (TOS)

Existing TOS Surveillance Architecture

Prepared for:

Caltrans District 4
June 1999

Prepared By:



Gardner Systems
Transportation Systems Engineering

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1. Introduction

The Caltrans District 4 Traffic Operations System (TOS) currently gets most of its traffic data from the inductive loop detection (ILD) stations deployed in the San Francisco Bay area. Because of a lack of widespread coverage and unreliable communications to the deployed ILD stations, the District is deploying new surveillance devices using proven communications technologies. It is the desire of the District to be able to deploy and integrate these new surveillance and communications technologies, and future technologies, easily and quickly. In order to make this possible, the District desires to migrate the existing TOS to an architecture that is based on national and statewide standards.

The purpose of this paper is to clearly define the current architecture of the District 4 TOS surveillance system.

Figure 1.1 shows the existing District 4 TOS Surveillance Architecture.

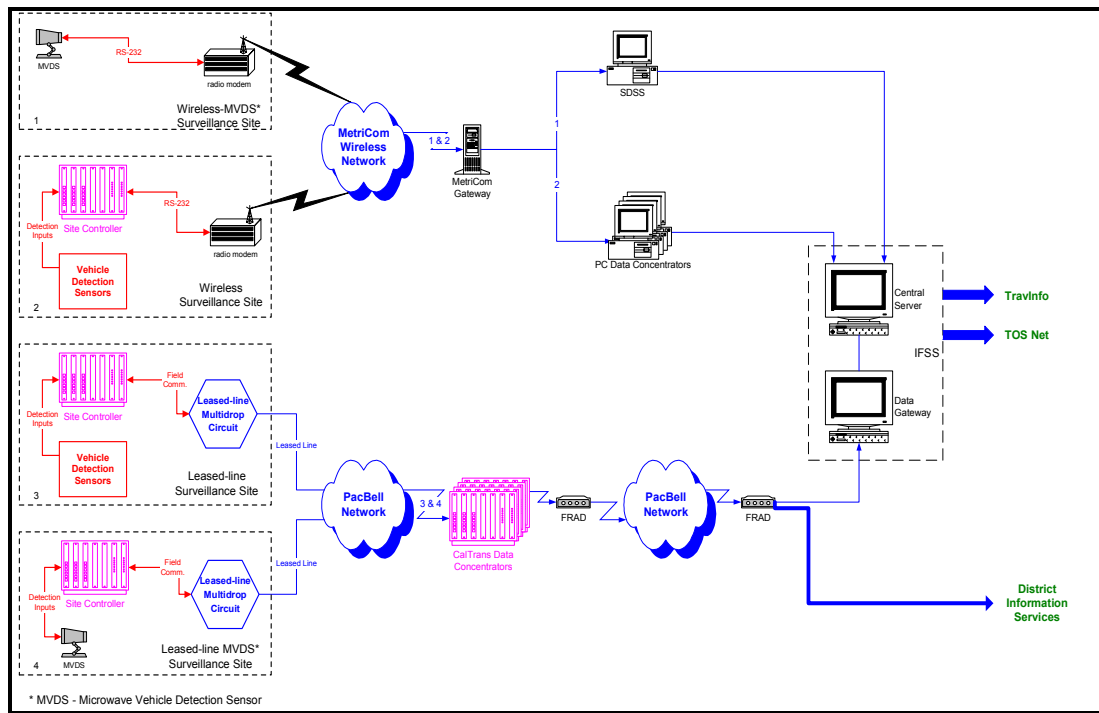


Figure 0.1 - Existing District 4 TOS Surveillance Architecture

2. Existing TOS Surveillance Architecture

The existing TOS traffic surveillance architecture involves three levels of data collection and processing – the field, data concentrators and applications. The field level includes the various surveillance devices used by the District. The data concentrator level addresses the unique features of each surveillance device and provides a common interface to higher level processes. The applications level includes the Interim Freeway Surveillance System (IFSS), which provides link data to TravInfo, and the District Information Services (DIS) which archives the surveillance data.

2.1 Field Surveillance Devices

The existing TOS surveillance architecture employs a variety of surveillance devices, including inductive loop detection (ILD) sensors and microwave vehicle detection sensors (MVDS) using Radar Traffic Monitoring System (RTMS) detectors. The data concentrators communicate with the field devices and their controllers via one of two methods: leased lines from Pacific Bell or the Metricom radio network. Because of a lack of reliable communications via the Pacific Bell leased lines, the District is phasing out this communications mechanism. Currently no error detection is performed at the field level.

2.1.1 Inductive Loop Detection (ILD) Sensors

At each ILD monitoring station, volume, occupancy and speed data are collected using a Model 170 Controller. Two types of freeway surveillance firmware are supported on the Model 170. Stations supported via the legacy architecture over Pacific Bell lines use Caltrans surveillance firmware that provides lane-based statistics at 30-second intervals. Stations supported via the newer Metricom radio network utilize a TransCore developed surveillance program that provides data at 20-second intervals.

2.1.2 Microwave Vehicle Detection Sensors

The RTMS detector stations operate as stand-alone devices that continuously collect lane-based volume, occupancy, and speed data. Data concentrators collect these statistics at 30-second intervals.

2.2 Data Concentrators

The existing TOS data concentrator architecture includes a mix of PCs and VME equipment interconnected at various levels to provide mainline surveillance data to higher level processes.

The data concentrators poll the field devices using the protocol specific to the field device. The data concentrators then convert this data to a generic format that is passed on to the higher level processes. These higher level processes include the IFSS and the data archival process. Due to current architecture limitations, only the legacy VME-base data concentrators provide archival data to DIS; the PC concentrator data is not currently archived. In general, no error detection is currently being performed at the data concentrator level. The only exception is with the SDSS, which is able to detect subsystem faults within the RTMS and suspend further processing of the data.

2.2.1 VME Data Concentrators

The Caltrans VME-based data concentrators collect data from the legacy Model 170 controller ILD stations (running Caltrans surveillance software) via leased lines from Pacific Bell. The Caltrans data concentrators poll these stations once every thirty (30) seconds. Upon receiving the data from the controllers, the data concentrators reduce data from the upstream and downstream detectors into one set of volume, occupancy and speed data. From this data, the data concentrators calculate the flow rate, percent occupancy and average speed for each lane. The data concentrators then pass this data on to the IFSS Data Gateway. Additionally, the surveillance data is passed on to the DIS for archiving purposes.

The Caltrans data concentrators interface to the IFSS Data Gateway by using a remote procedure call (RPC) interface developed by Caltrans personnel. Caltrans personnel also developed the Congestion Pricing software that operates on the VME-based data concentrators and the Data Gateway.

There are a total of three (3) VME-based data concentrators. Two are located at the Oakland Bay Bridge (Oakland Hub and San Jose Hub) and one is located in a Caltrans facility in Walnut Creek (Walnut Creek Hub). The data concentrators are connected to the IFSS Data Gateway in the TMC over 56Kbps frame relay connections.

This data concentrator architecture is being phased out by Caltrans due to complexity and reliability concerns.

2.2.2 PC Data Concentrators (PCDC)

The PC-based data concentrators (PCDC) collect data from Model 170 controller ILD stations (running TransCore controller firmware) via the Metricom radio network. The PCDCs poll these stations once every twenty (20) seconds. Running TransCore software, the PCDCs interface directly to the IFSS Central Server to forward data to TravInfo. Because this data is forwarded directly to the IFSS Central Server, it is not archived by the DIS. The PCDCs do not have an internal archival capability.

A total of four (4) PCDCs are currently installed at the TMC. The PCDCs currently access the Metricom gateway via serial lines. The PCDCs interface with the IFSS over an Ethernet network using a TransCore proprietary protocol.

2.2.3 Supplemental Data Surveillance System (SDSS)

The Supplemental Data Surveillance System (SDSS) server is another type of data concentrator used in the system. Gardner Systems developed the SDSS server as part of an MTC project. The SDSS operates on a Pentium-class PC and collects surveillance data from the microwave vehicle detection sensors via the Metricom radio network. The SDSS polls these detection stations once every thirty (30) seconds. Because the surveillance data collected by the SDSS is passed directly to the IFSS Central Server it is not archived by the DIS. However, the SDSS does have the ability to store up to 30-days worth of surveillance data.

A single SDSS server is currently installed at the TMC. The SDSS currently accesses the Metricom gateway via serial lines. The SDSS interfaces to the IFSS over an Ethernet network using a TransCore proprietary protocol made accessible through the use of TransCore-supplied libraries and header files. This interface is the same one used by the PCDCs.

2.3 Applications

2.3.1 Interim Freeway Surveillance System (IFSS)

The Interim Freeway Surveillance System (IFSS) was installed as an interim measure to provide surveillance station data to TravInfo. The IFSS currently aggregates individual lane data into link-based traffic measurements and performs data validity checks prior to forwarding to TravInfo. Additionally, the IFSS provides status information to indicate the availability and reliability of the link data. To accomplish these functions, the IFSS is made up of two distinct processes – the Data Gateway and the Central Server.

The IFSS Data Gateway, running on a Sun workstation, is responsible for collecting surveillance data from the Caltrans VME-based data concentrators and aggregating this data into a single package for transmission to the IFSS Central Server. The IFSS Data Gateway retrieves the data from the data concentrators every 30 seconds through the use of remote procedure calls (RPC) to the data concentrators. The current implementation of the IFSS Data Gateway and the Caltrans VME-based data concentrators do not use standard RPC; rather they use a quasi-RPC developed by Caltrans personnel. Caltrans developed the Congestion Pricing software that operates on the Data Gateway.

The IFSS Central Server, also running on a Sun workstation, is responsible for performing the data validation checks and calculating density and congestion levels. Additionally, the IFSS Central Server aggregates individual detector station data into link data by averaging the data for all detectors associated with a particular link for one-minute periods and five-minute periods. The IFSS Central Server establishes link status by checking the detector station communication throughput and data reliability. The Central Server communicates with the Data Gateway to collect data from the Caltrans VME-based data concentrators, and communicates directly with the PCDCs and SDSS to collect surveillance data from these systems. Data is collected every 30 seconds using a TransCore proprietary protocol made accessible through the use of TransCore-supplied libraries and header files. TransCore developed the Central Server software.

Data for HOV lanes is extracted and reported by the Central Server during periods of HOV lane operation. During the hours when the HOV lanes are not operational, data for these lanes is reported as zero values. The IFSS Central Server does not report the status of HOV lanes separately from the other lanes due to their common communication failure point and the inability to compare HOV and non-HOV lane measurements reliably.

Once the surveillance data has been validated and aggregated, the link data is sent to TravInfo via UDP broadcasts.

The Central Server and Data Gateway communicate over an Ethernet network. The Central Server uses this same network to communicate with TravInfo. However, back-to-back routers interconnected by a 56kbps serial interface separate the TravInfo network and the Central Server network (also known as the TOS LAN). The IFSS Central Server continuously broadcasts the link data message over this connection.

The link data messages broadcast by the IFSS Central Server use a messaging protocol as defined in **Table 0.1**. **Table 0.2** shows the link communications/data status codes while **Table 0.3** shows the congestion codes for the link data message.

2.3.2 District Information Services (DIS) Archival

The Caltrans District 4 Information Services group operates an archival server that collects raw surveillance data directly from the Caltrans VME-based data concentrators. This data is stored for off-line analysis as needed.

The archival process uses the Caltrans Congestion Pricing software to collect data every 30 seconds from each of the VME-based data concentrators. It is the same process used by the IFSS Data Gateway to collect similar information.

Due to current architecture limitations, only the Caltrans VME-base data concentrators provide archival data to DIS.

NAME	FORMAT	SAMPLE	LENGTH	DESCRIPTION
1 Originating TMC ID	C7	CTD04nn	7	nn is a center number to be defined
2 Info. Dissemination Report ID	C4	JF02	4	Link data
3 Link Model Version	C3	nnn	3	Sequence of number for link model
4 Report Date	C10	dd/mm/yyyy	10	dd = day of month, 01-31 mm = month of year, 01-12 yyyy = year, e.g. "1999"
5 Time Stamp	C8	hh:mm:ss	8	hh = hour of day, 00-23 mm = minute of hour, 00-59 ss = second, 00-59
6 Number of Links	C6	nnnnnn	6	Number of links to follow
7 End of Record	C1	n	1	EOR character
8 Link Data (for each link)				
a) Link ID	C6	nnnnnn	6	Link ID
b) Status	C2	nn	2	Status of communication and data
c) Current Speed	C3	nnn	3	Range 0-999 miles/hour (typical 0-100)
d) Average Speed	C3	nnn	3	As for c)
e) HOV Lane(s) Current Speed	C3	nnn	3	As for c)
f) HOV Lane(s) Average Speed	C3	nnn	3	As for c)
g) Current Volume	C4	nnnn	4	Range 0-9999 vehicle/hour/lane (typical 0-2500)
h) Average Volume	C4	nnnn	4	As for g)
i) HOV Lane(s) Current Volume	C4	nnnn	4	As for g)
j) HOV Lane(s) Average Volume	C4	nnnn	4	As for g)
k) Current Congestion	C2	nn	2	Index. See Congestion Values Table. (typical 00-06)
l) Average Congestion	C2	nn	2	As for k)
m) HOV Lane(s) Current Congestion	C2	nn	2	As for k)
n) HOV Lane(s) Average Congestion	C2	nn	2	As for k)
o) Current Density	C3	nnn	3	Range 0-999 vehicle/mile/lane (typical 0-250)
p) Average Density	C3	nnn	3	As for o)
q) HOV Lane(s) Current Density	C3	nnn	3	As for o)
r) HOV Lane(s) Average Density	C3	nnn	3	As for o)
s) Current Occupancy	C2	nn	2	Range 0-99 percent filled (typical 0-99)
t) Average Occupancy	C2	nn	2	As for s)
u) HOV Lane(s) Current Occupancy	C2	nn	2	As for s)
v) HOV Lane(s) Average Occupancy	C2	nn	2	As for s)
w) End of Record	C1	n	1	EOR character
9 End of Record	C1	n	1	EOR character

Table 0.1 – IFSS-to-TravInfo Link Data Message Content

STATUS CODE	COMMUNICATIONS/DATA STATUS
00	Communications and data OK, HOV lanes inactive
01	Communications and data OK, HOV lanes active
10	Data unavailable, HOV lanes inactive
11	Data unavailable, HOV lanes active
20	Suspect data, HOV lanes inactive
21	Suspect data, HOV lanes active

Table 0.2 – IFSS Link Status Codes

CONGESTION CODE	CONGESTION LEVEL
01	No Congestion
02	Light Congestion
03	Moderate Congestion
04	Heavy Congestion, Traffic Flowing
05	Heavy Congestion, Traffic Choking
06	Heavy Congestion, Traffic Stopped

Table 0.3 – IFSS Link Data Congestion Codes

3. Conclusion

The existing District 4 TOS surveillance architecture consists of a variety of systems and software developed both by District 4 personnel and by outside consultants over an extended period of time. Currently the TOS does not employ a standard, open protocol for communications between the processes that make up the TOS. The data concentrators retrieve surveillance data from the field using device-specific protocols; the data concentrators communicate with the IFSS using a Caltrans quasi-RPC interface and TransCore proprietary protocol. The IFSS supplies link data to TravInfo via a published messaging protocol; however, this protocol is not based upon any existing inter-process communications standards.

The variety of systems, software and protocols being used makes it difficult for District 4 to add data from additional data sources to the TOS. These additional data sources include other surveillance mechanisms such as probe vehicles, video image detection systems (VIDS), Smart Call Boxes, Freeway Service Patrol (FSP) probe data, and external data sources such as Silicon Valley Smart Corridor. Additionally, the only data available from the IFSS is output in link format. This makes it difficult for the District to

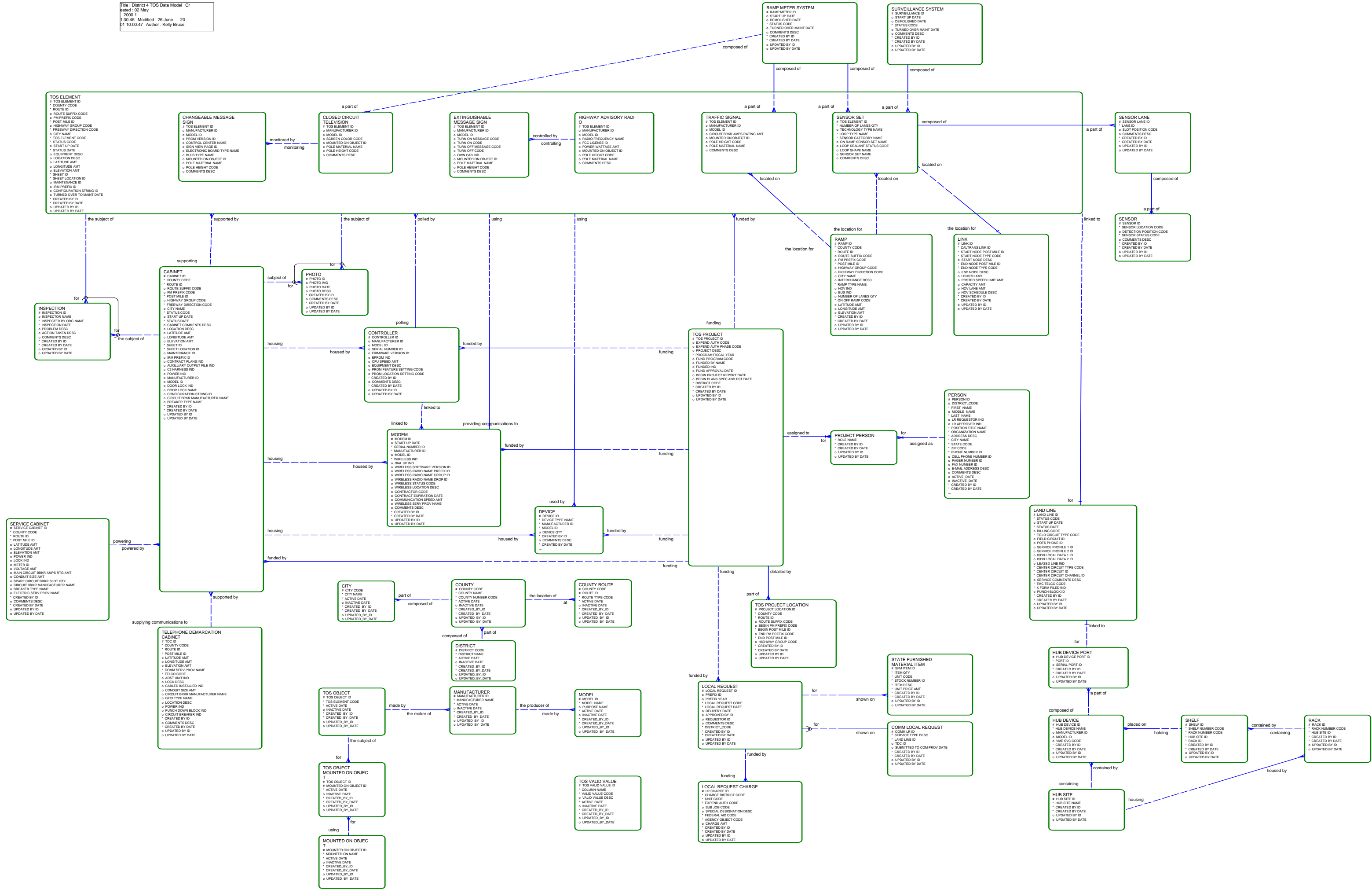
provide surveillance data in raw format for those parties who might be interested in this data.

The fact that the IFSS Central Server performs the data validation increases the difficulty of identifying the exact nature of any data and/or communications errors. Ideally data validation should occur at each step of the process, starting with validation of the data the controller retrieves from the detector stations.

Data archival is also not consistently performed for all data concentrators making it difficult to perform any off-line or post analysis of collected information. The lack of a common network management capability together with the current disjointed architecture makes it difficult to monitor TOS performance and perform fault detection and isolation.

In order to facilitate the addition of other data sources, enhance data validation, and provide data to more interested parties, the District must look at implementing an architecture that employs national and statewide standards where applicable and coordinate with contractors currently designing or implementing components of the TOS, TravInfo and other regional and statewide initiatives

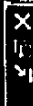
APPENDIX A-2- TOS DISTRICT 4 DATA SCHEMA



APPENDIX A-3- SAMPLE TOS FIELD EQUIPMENT INPUT FORMS



ORACLE



19 field Element Input

Project Description

Program FY

District EA Press

Fund Program Code

Funded By

Funded No

Project Report Date

Fund Approval Date

Plans Spec & Est Date

Created By

Created Date

Updated By

Updated Date

Created By

Created Date

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<input type="button" value="Save"/> <input type="button" value="Print"/> <input type="button" value="Delete"/> <input type="button" value="New"/> <input type="button" value="Clear"/>		<input type="button" value="Cancel"/> <input type="button" value="OK"/> <input type="button" value="Apply"/> <input type="button" value="Help"/>	
<p>Elements</p>			
<p>Benefit Type <input type="text" value="LOS"/></p>	<p>Maint ID <input type="text"/></p>	<p>County <input type="text"/></p>	<p>Route <input type="text"/></p>
<p>City <input type="text"/></p>	<p>Post Mile <input type="text"/></p>	<p>Post Mile <input type="text"/></p>	<p>Post Mile <input type="text"/></p>
<p>Equipment Description <input type="text"/></p>	<p>Location Description <input type="text"/></p>	<p>Freeway Direction <input type="text" value="Northbound"/></p>	<p>Control Center <input type="text"/></p>
<p>Status Code <input type="text"/></p>	<p>Status Date <input type="text"/></p>	<p>Latitude <input type="text"/></p>	<p>Longitude <input type="text"/></p>
<p>Start ID <input type="text"/></p>	<p>Start Up Date <input type="text"/></p>	<p>Configuration String <input type="text"/></p>	<p>Updated By <input type="text"/></p>
<p>Manufacturer <input type="text"/></p>	<p>Model <input type="text"/></p>	<p>Control Center <input type="text"/></p>	<p>Prom Version <input type="text"/></p>
<p>Electronic Board Type <input type="text"/></p>	<p>Bus Type <input type="text"/></p>	<p>Mounted On <input type="text"/></p>	<p>Comments <input type="text"/></p>
<p>Pole Material <input type="text"/></p>	<p>Pole Hgt <input type="text"/></p>	<p>Phone # <input type="text"/></p>	<p>Updated Date <input type="text"/></p>
<p>Created By <input type="text"/></p>	<p>Created Date <input type="text"/></p>	<p>Updated By <input type="text"/></p>	<p>Updated Date <input type="text"/></p>

[illegible]

APPENDIX A-4- TOS DISTRICT 4 REQUIREMENTS AND BUSINESS RULES

TOS District 4 Requirements

And

Business Rules

(Draft)

Prepared by Information Systems and Service Center

Author:	Pat Woodward, Lisa Knott
Creation Date:	6/2000
File Reference:	TOS Requirements
Last Updated:	
Document Number:	
Version:	Draft

TOS Requirements - Business Rules

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PURPOSE:

The purpose of this document is to provide information for conversion of the existing TOS database to a new Oracle database. The Requirements and desires of the users have been noted and are listed below.

OVERVIEW:

The system to be developed is expected to be an Oracle Database that will replace an existing system that is written in Microsoft Access and operates on a Windows NT network. The goal is to deliver a system that accomplishes the same functionality as the current system but uses Oracle as the database and adds a GIS application. It must also allow for expansion into a more comprehensive system that links to other databases and performs additional functions. District 4 has expressed a desire for the system to be accessible via the intranet.

ACCESS TO OTHER DATABASES:

Be able to access CADD files from PSE, the Electrical Design Group. If know EA number can get file, need to remove electronic signature to access. DDN Microstation files (not Phase 1).

Be able to access files in Construction's Access database, on same server, use ODBC Connectivity.

Be able to access IMMS, PMCS, CAS to get Project, Construction and Maintenance data.

Related database issues:

MMSI is a Clipper database which will be replaced with IMMS in about 12 months in some districts (first 3 then 7). There is no read-access to the current MMSI system.

Minor B contracts are under \$100,000 and are not on CAS. Minor A contracts are over \$100,000 and are on CAS.

PMCS has project description including engineer's name. (Plans have metric measurement. Postmile and kilopost - cannot rely on it for limits of job).

SECURITY:

Administrators have all the power. They can add new users, add new values to LOV's, read, update or delete any record.

TOS REQUIREMENTS - BUSINESS RULES

DRAFT

Managers can delete records belonging to their group.
Contractors will have a set role and level of security to be determined later.
A log will track what the user does by table and record.

DEFINITIONS:

ADN - Advanced Digital Network circuit
ATMS - Advanced Traffic Management System
CCTV - Closed Circuit TV
CMS - Changeable Message Sign
Capacity - count of vehicles/hour/lane
Dynamic DB - Data comes from the field every 30 seconds
EMS - Extinguishable Message sign
GIS - Geographic Information System is Arcinfo
HAR - Highway Advisory Radio
HOV - High Occupancy Vehicle lane. Also called 'diamond lanes'.
NET - combines Static & Dynamic
OLTP - On-line Transaction Process - returns data every six seconds
POTS - Plain Old Telephone Service
Portal - needed so can access DB from the field
Portalet - 3 windows to see three things
Ramp meters - measure traffic on On Ramps
SFM - State Furnished Materials
Static DB - users put in data
TDC - Telephone Demarcation Cabinet is the connection to the public telephone service.
TMT - Transportation Management Team
TMC - Transportation Management Center
TOS - Traffic Operations System
VehDet = loops = sensor - all mean the same thing

CLIENTS & USERS:**PLANNING:**

Produce Project Study Report (PSR is like an FSR)

Includes alternatives and cost estimates

Then do Project Report - may get several Project Reports for one PSR

1. Field visit to check site, get aerials and as-built plans
2. Detail the plans, refine the estimates, get environmental clearances and utility clearances, get counts

Need to enter info on new camera equipment to be installed when it's in the planning phase

PS&E - DESIGN PHASE:

The Electrical Design group lays out the circuit diagrams and detail design.

Input into database detail design, services, how to connect, fiber optics or not, service provider name and cabinet information.

Package goes out for bid and a contractor is awarded Design Phase - different branches review

Design Phase may change or add to plans and refine locations (but Access DB is read only for designers)

CONSTRUCTION:

Build the project

When they find loops already there they add it to DB

Loops may be out of order during construction

Construction may make changes to original plans creating "as-built plans"

System operators - change data as build project. At time of Construction

Award the cabinet is created and the parts are finalized

PROJECT DEVELOPMENT GROUP:

Produce Status of Projects Report - tells what's happening. Whatever they review, they put into binders.

TRAFFIC OPS:

Prestudy to activate - review what was built

Check cabinet details and updates DB

Change last digit of EA from 1 to 4 for operational

Accepts job as completed. Elect Ops gives it over to Maintenance. Elect Ops tells TMC it is operational and you can use it. Update status to indicate its operational

Activate, maintain and operate

Have Project Plan and visit site

Make corrections to location data

Add Plan sheet.

If have multiple cameras at one location, need a record for each

Update status of equipment and make corrections to info

Equipment status is:

Functional, works in test in cabinet

Operational, communicates with the office

Out of order

MAINTENANCE:

Does not use current system. Mario sends his info to MMSI, MMSI issues a ticket number, but they don't return a status when it's fixed. Need a connection between MMSI and this DB

BUSINESS REQUIREMENTS:**INQUIRIES:**

Be able to inquire by Project (or EA) and find all elements related to the Project.

Be able to inquire by cabinet identifier.

Be able to inquire by county, route, postmile to retrieve all the EA's that have been used previously.

There should be a series of project records for a series of EA's. When put in new equipment add a new record and when replace old equipment change status to 'replaced'.

Search for installed facilities. Now use wild cards to search string for installed items:

Use '*TV*' to find CTTV, field has all equipment strung together with slashes between: TV/RM, SURV/TV.

If a search returns a list of records - need to sort by postmile.

Be able to generate certain forms.

UPDATES

Updating must be controlled by the security process. When allowed, the user should be able to update the records they retrieve. The 'updated by' and 'update date' fields will be updated when the record is updated. The current date will populate the 'update date' field and the userid will populate the 'updated by' field.

STORING DATA:

Entering records into the system must be controlled by the security process. When allowed, the user will be able to enter records into the database depending on edit criteria. The 'create by' and 'create date' fields will be filled in by the system when the record is entered. The current date will populate the 'create date' field and the userid will populate the 'created by' field.

Equipment elements and devices are identified first and the cabinet is set up later. Need to be able to enter devices into tables before linking to cabinet. Use location and project data to identify cabinets and elements.

History should be stored on each record of each table: Create date, created by, updated by, update date.

A digital camera picture of the inside and outside of the cabinet should be included with data.

Additional info:

Numbers on the front of cabinet can be seen from Mainline (freeway). There may be several numbers on cabinet for different equipment. Add numbers to DB.

Exact CMS PM - Postmile of the pole may be different from the cabinet, so for equipment use the equipment's PM on DB.

Need to know which equipment is attached to which controller. Each has an address.

On 170 controller, don't use serial number - need address.

Need to add Radio (controller or drop number).

Need to see it on both radio and controller screen.

Search requirement: need to find by 'any' field.

Local request procedure needs to be redesigned (per Jaz).

Want to add a quantity field on the Purchase Order

Phone service request:

Need to assure that Local request number is unique.

Need active EA number on the screen

Overhead EA is for recurring costs

Service Type table:

Need to be able to add items to List of Values (LOV) - administrator can update.

REPORTS:

The Report Request Process will be on the Management Tool screen.

DATABASE INFORMATION:

KEYS/ENTRY POINTS:

Database keys, will be invisible to the user and will uniquely identify each record. They will not be tied to any logical or physical characteristic.

On Access system the Cabid field is a unique system generated number and is the primary key: 'X' for cabinet + direction + county + route + postmile

Each piece of equipment has an IRM number based on location (like Cabid).

Other Ids: CTID is Caltrans id number, label on outside of cabinet is an identifier for equipment inside.

Want to be able to select all items for an EA.

Want to be able to select all items for a Postmile range.

GENERAL INFORMATION:

All loop detectors for both sides of the road are in one cabinet - up to 8-lane limit.

Each device has identifying information:

Manufacturer, serial number

EA field determines project funding and is required. EA phase gives Status of project. Last digit is 0...4 depending on phase.

Comment fields are free form text - related to cabinet and each element.

When switch from wired to wireless on Surveillance, delete the Communications portion. The type field is wired or wireless. If wireless is chosen, bring up the screen for Ricochet modem. Metrocom is cellular or wireless service, PacBell is for wired.

Let the user choose to disconnect link from Communications table and link to wireless modem.

SPECIFIC TABLE/EQUIPMENT INFORMATION:**Cabinet table info**

All devices belonging to one system are in one cabinet. A cabinet may contain several systems.

TV's are one device per cabinet

Equipment startup date should be on the table for all equipment. It is the date when the equipment became operational. Field is modifiable by users.

Sheet# comes from PS&E Plan sheet# .

A digital camera picture of the inside and outside of the cabinet should be included with cabinet data.

EMS does not always need a controller; it may use a wireless modem.

Wireless modems

For loops- data is sent directly to PCDC (PC data concentrator).

For CCTV- data is sent through antennae.

M400S - Modem 400 is inside 170 controller, not in the cabinet - should be in device table. The 170 is being phased out and replaced with wireless.

242 & 222 Sensor Units detect vehicles passing over loops. Info includes Cabid, item, and quantity manufacturer.

Power strips plug into back of 170 - add manufacturer, can go into separate table. May be more than one per cabinet.

Dial up modems, can be more than one per cabinet. Id by manufacturer.

TDC

Telephone demarcation cabinet - end of public phone line. Caltrans line goes from there to main cabinet. Need TDC table for telephone demarcation cabinets.

Service Cabinet

End of public utility line - Caltrans line goes from there to main cabinet. Supplies electric power. Includes electric meter - fields include meter number, circuit breaker info, amperage.

Surv Equip

Surveillance Systems include Ramp Meters and Monitoring stations which require IRM or TD-links. TD-links and IRM-links are duplicate info. Other devices don't need it. TD-link table identifies Highway link segments by Off ramp to Onramp segments defined by Postmile boundaries. Segments are tied to cabinet num and is needed by TMC to identify from which loop & cabinet field data is coming. Monitoring stations are on the Mainline and Ramp Meters are on the On ramps, but information from the Mainline can affect the Ramp metering. Loop detectors are a monitoring station. VM is vehicle monitoring station. VIP is visual detector. VMDS is vehicle monitoring detection station VMDS-ID is the device ID. VMDS table is the Surveillance table.

The following fields will move from Surveillance to Controller table:

Add a field to Controller table for Type of Controller.

Prom feature - in 170 Controller is the switch number. It plugs into the Controller inside the box. 2 or 0 is hex data, alpha-numeric Firmware configuration settings. 1 prom file for 1 controller.

Locprom - rename to location address in controller table it is a set of DIP switches

The VME gets surveillance info from CME in the field and uses IRM to determine where it came from. If no VME, it's wireless.

Config string is a calculated string (per Sean) – bit patterns which tell which pieces of info come from which individual equipment. Create 2 new columns: start byte offset, stop byte offset; numeric.

Status of cabinet is for cabinet only - like if car runs over it. Each piece of equipment has status.

When change status to operational, Lat-Long is required.
Each element should also have a status

VDS

Vehicle Detection station:

IRMID is the unique identifier for field equipment and controllers and it has info that goes with config string to decode the data for the Dynamic database. The byte offset and IRM info is used in polling the controllers. There is a configuration file which uses a mask. The byte offset separates the data for each set of monitoring stations. Some detector stations are linked to a controller or a cabinet and some are not. It sends a packet of data. If it's wireless, don't use the byte offset. If need to use Byte offset calculate it one way if have a real cabinet and another if have no cabinet. Can change the way it's done and use 'begin data', 'end data' flag instead of calculating it.

Locationbase table

Locationbase on the Access DB should be Project or EA Table on the new database. It gives EA info as well as location by County, Route Postmile, also Project engineer, consultant information. Each element and each cabinet has an EA, because each part may have been put in by different projects. They would like to keep a history of EA's for each item. The overhead EA is used until the project is funded. A Project Status Report is needed to show what is funded and what is not. The location-type field is the type of equipment at that location.

EAbase table

On ACCESS it is a project sub table, the EA points to the Project. Client would like to use EA to link to Construction DB as read only. PMCS is a DB2 database/warehouse on Teale which keeps track of milestones of project/construction. The users want to see those that are built, those that are proposed and the status. The last digit of the EA indicates the status or phase. When it is updated from 1 to 4 that EA in all other tables wherever it is found should be updated. Construction is Phase 4 and Maintenance is Phase 5. The Project Status shows where the project is - Planning, design, construction or operation. EA phase gives Status of project. Last digit is 0...4 depending on phase

Combase table

(All communications info is in one table - will need to separate out in new database):

TDC-ID is telephone demarcation Cabinet identifier

A HUB is a building and the VME devices are inside it: SRVR1 is wireless.

Others are SJO1, OAK1, WCI, SM1, FRMT, DMBR, VLJO,

There are 6 or 7 Hubs all connected. All data in San Jose goes to Hub and gets concentrated and then passes on to TMC.

On Access DB VME column should be named HUB

One cabinet can have many communications services attached to it: ISDN, POTS, T1, PDT, radio/wireless modem.

Data circuit id comes from Pac Bell like a phone number.

3002 data circuit brings data from loops to TMC

TDC polls and 170 sends it thru 3002 circuit.

1 circuit to 1 element in cabinet

Use ADM for CCTV

Use POTS for dial up monitoring of CMS & EMS & HAR

Can be several phones in one TDC box - 3002, ADN, FR, POTS

To get data from loops poll using circuits.

ADN (Advanced Digital Network circuit) is always on, ISDN is not. ISDN is used to turn camera on/off. ADN can handle more data. Can tilt and pan camera as well as send data.

T1-crt-id-ch, 24 channels on T1. Use channel to determine which camera it comes from.

T1 channel - Phone number and channel should be two separate fields.

LDN1- ISDN port - local dial number

SPID1 number includes area code and ISDN identifier

Data-ckt-id is data circuit identifier and is used on loops and surveillance only. Moving to wireless. Ramp meters are wireless.

Now there is one data circuit per TDC, but there could be many later
There are multiple POTS/TDC

TTC-Telco - Traffic Operations Center- Should be Traffic Management Center. Service provider gives ID for their location. Assigned by service provider.

X-form-fil Fill out form to request service - should be sequential number for LR order instead of Yes/no. Cannot submit LR if X-form not filed.

Radio-id is Wireless Radio-id- modem serial # and belongs in the modem tbl. Wireless has an antenna on top of cabinet and repeaters boost the signal to send to wireless network provider and then by land line to TMC and then to server.

Revised Radio id is a range of numbers - started with one numbering system and had to renumber. Radio-id field has current number. Revised Radio id field has old number (is it still needed?).

RI-modem-status is status of radio modem .

Radio-name: modem info - loop detector has concatenated CT Number + Group + Drop which may duplicate Surveillance info and belong in modem table.

NW-Link-ID: assign a number for segment from off-ramp to on-ramp.
When add more loops had to split segment and add more numbers - may not be sequential. Post mile increases from South to north and east to west. NW links are north or west bound. These should also be on the ramp table.
TD-link is not used.

Comm-status: Same as RF Modem status. Values are the lights in the field, Red, yellow, green or blinking.

Location-description: Field not needed, use comment field if there is an exception.

Software field belongs in Radio Table version of software used.

When an element becomes operational it must be connected to either a land line or a wireless modem .

Tbltdlinks Table

Used only for Ramp meters and surveillance

Rtype is 'US', Route is '101', Route is 'US101'

Equipid1 (in Access) belongs on equip table and then link to links.table

Start-node-name: Name of road coming into the freeway - text format

Link-type: 'Main' or 'Conn' depends whether it's a main route or a connector route.

HOV: Not part of the Main-line, but may have a ramp meter if it's on the ramp.

Ramp Meter Table

This table was imported six months ago and not linked to other tables. It will connect to Ramp Meters and Surveillance. CABID links to location and ties Ramp Meters to cabinets and other elements. Ramp meter table links to another table called New Sensors.

RMID Unique identifier consisting of letter 'E' + county num + 2 char/digits
Identifier matches the State Maintenance DB (IMMS)

County, route and PM of Ramp Meters may be different from Cabinet

Rmdir - direction of traffic where ramp is located. Required field.

Interchange - free form text description of interchange

Ramp Type - pull down menu (LOV) - type of Ramp includes, hook, diagonal, connector

Date active - Date the Ramp meters became active (operational) to meter traffic. Once date is set, it cannot be changed, except by administrator. When entering the new record, populate the field with the system date and allow the user to update. After the record has been saved, user cannot update.

Status - need pull down status table (LOV). Values: PS&E, Design, Maintenance, etc. When status changes to operational force to link to cabinet. If status changes due to cabinet being out of order, set all elements tied to the cabinet to be out of order, too.

Numlanes - total number of lanes in the on Ramp, i.e. one lane for HOV, two for regular

County1, dir1, ramptype1, Status1, Route1 - skip these fields on Access DB.

Description - need table (LOV) for type of equipment and it must be specific to the equipment.

City - look up in city table, LOV

Tdlink - Assign to ramp meter same as loops/surveillance, except put 'R' at front to show that it's for a ramp. Data comes live from the 170 so 'R' is used to identify source.

Tblrm is general description for Ramp Meters only.

Equipment IRM - Describes the location of the equipment. Concatenate County + RT + PM + Equipment type

Initial - Identity of Operator creating the record.

New Sensors Table

This table is linked to Cabinet table by Cabid, to Location base and to Surveillance station by Survid. It contains Sensor info for Surveillance and Ramp Meters. The configuration of the loops matches the cards in the cabinet. There are 14 slots per box - detector cards go in seven for each direction. There are different cabinets for each direction, so there is only one fwy dir/cabinet. Detectors (DT number) use both directions, but ramp meters (E number) use only one direction, some are on mainline and some are on ramp. The Ramp Meter table has Post mile info so it's not needed here.

SensorIrmid - location of sensor

NE lane 1---7 Mainline - Map info from lane to slots in 'input file' in cabinet. First seven slots get lanes 1 thru 7. Data format is 'T' + lane direction + input file + upper or lower, i.e. 'TNIU'. One card controls one lane. There are two loops in a set upper and lower. Switches connect to loops in lanes. There are three sets of loops. Passage is nearest to mainline and shows traffic entering mainline. Demand is next and shows traffic waiting. Queue is at top of onramp and detects that traffic is backing up into city street. In DB should change to 4 lanes each to allow for expansion. Can put a meter on an Off Ramp to see how much traffic detours from mainline.

Vehdettype1 & 2 - Type tbl shows types of loops and sensors - magnetometer, optical, etc. On concrete use magnetometer on other surface use other type. Use all the same type loops at each location. Use equipment type table (LOV) to validate.

NEOnRL1P - 'NE' is direction, 'On' is on ramp, 'R' is ramp, 'L1' is lane 1, 'P' is passage loop.

Loop sealant - condition of sealant that covers the loops. If it cracks or breaks, the wires are exposed and it's 'bad' otherwise it's 'good'

Pavement type - Asphalt / concrete / etc

Pavement condition - Visual inspection: good/bad

Test loop to see if it carries electricity:

Resistance loop- greater then 500 OHMs.

Inductance loop -

Loops lat/long - being entered for every element

HAR - Highway Advisory Radio

Harid - primary key - system generated: 'HR' + three digit number. Can be larger for expansion.

Equipment Rec - foreign key to equipment table??

Loc Rec - foreign key to location tbl

Com Rec - foreign key to combase table.

EquipmentGeoLoc - free form text describing location

City - city tbl

Controller Table

The VME is at the HUB. It concentrates data from the field. The decoder decodes the TV image. The Codek is in the CCTV info table.

CCU - Camera Control Unit is a part of the TV in the field

The controller model is 170, may have 'A' or 'E' attached. Different Models use different software for different purposes. Don't need serial number.

Controller firmware is software burned into Eprom chip.

No longer need fields for: other equipment, status, within Project scope.

Status of device reflects status of whole system, don't keep status on each little item. Don't need Radio No. Group and drop info is in modem table for surveillance.

Surv Equip

This is the complete monitoring station including loops and cabinet equipment. The status refers to whether the whole system is working together. Foreign keys link it to the Cabinet. It does not link directly to the Project Table, because each piece of equipment links to the project table and several projects may have been involved in building one surveillance station. One record in this table links to many sensors.

The Prom Feature and Loc Prom fields should be moved to the Controller Table. The Prom Feature is in the 170 controller box. Data is HEX or alpha numeric, firmware configuration settings. 1 Prom feature for 1 Controller. Loc Prom should be renamed to Location Address. It is a set of DIP switches in the controller.

RTMS - Radar Transportation Monitoring System is like the sensors but uses radar. A new table will be needed for that.

Maintbase

May need to merge this table with Services table - has date of service. Change 'entry date' which is the date malfunction was reported to use more descriptive name. Add 'date sent to Maintenance' field. User's logon id will automatically be filled into 'Entered by' field. Resolved Date is date system was fixed. # of days can be calculated as: resolved date - entry date. Add a link to Communications table instead of putting 'phone circuit' info here. Allow one ticket per circuit - like a problem ticket.

If resolved date is empty the problem is unresolved. If not resolved, equipment will not work. Need to connect to status of each element so if this changes to resolved they will all change to operational.

x-form. xy-form shows intersection where fix is.
Ticket number may be generated by the system.

Pac Bell tech - The person who fixes the problem.

This table was previously used for PacBell problems, should be used for all problems and it should link to each element. It maintains a history of service on the equipment at each location. It is used by the TMC Operators and by Maintenance to review and see what is needed.

1. Maintenance follows the routes and checks everything.
2. Gardner's contractors go out and inventory field elements.
3. Malfunctions occur requiring service.

Fields to be added include a field to identify which element had a problem requiring maintenance.

Must replace parts with matching parts and don't change the EA, so just add a comment. Change serial number in rec if it's wireless.

Table should tie to a system, not an element. Systems are: CMS, HAR, CCTV, Ramps, surveillance, communications. A system goes from the field to the cabinet to the TDC to PacBell to the Center and includes all parts and communications. The whole thing works or it doesn't.

EngineerBase

When fill out Purchase Request look up the person and info in this table. Links to SFM, LR, CommLR. Keep full name, Address, Persons role (Engineer, tech, PacBell. Change company name to ORG. i.e. Caltrans. Delete data currently in the comment field, but keep the field. Keep e-mail, date is current date, change 'Notes' to 'Comments'. Drop other address - only need one.

Initiate Service**H2O Form, X-Form and Y-Form**

Electrical Engineers send request to PacBell to provide service. PacBell's response to request goes to Electrical Engineer.

Local Request is attached to X-form & Y-form and goes to (Yolanda Henderson at ISSC) who fills out STD 20 Forms which officially request service and makes it possible to pay the bill. This is sent to PacBell. The Y-form is also sent to them and they send it back with their notation of where service will be provided.

Local Request (LR) is created by Electrical Engineer. The Internal LR has two parts, one to request service and the rest is related to State Furnished Materials (SFM). These are 170 controllers and equipment purchased from the state with CMAS contract and are delivered to the contractor to build the cabinet.

There is a form on the system for the user to fill out and print. Info on the x-y form is not used in the DB for querying or anything. Each element needs to communicate so need to request service through the LR number process. Add a field: LR# , so can track elements that it's tied to. Order 100 controllers at a time - not specific about where they are used until setup.

Internal LR - Table not used.

Can use CommLR for both.

CommLR

Does the request for Communications and SFM material used to generate LR Purchase order. SFM is used to request material from Maintenance. I.e. 170 stock number is automatically filled in. On Access table SN1--- is stock number of each item. Q1---Q7 is quantity, U1---U7 is units, D1---D7 is description. One record is up to seven items in the order. Use an array for each one.

Local Request ties to a project funded by an EA. Change table to system, Surveillance, Ramp Meters, CCTV, etc. Elements tie to system table. Cross ref num is not needed - EA is tied to project.

EABASE

This is an orphan table. There are no screens attached. It was copied from Filemaker Pro, but it is not used now. (I promised them the same functionality)! The information should be added to the Project table. Project location is in Eabase tbl - tells where project is. EA changes during the project. The last number starts at phase 0, PS&E is Phase1. Approved is Phase3, Construction is Phase 4. The EA should automatically change as the

project goes from one phase to another. The EA is five characters and the last character is the Phase. Could use this in the System, then could always locate the project by the five numbers and the sixth would give phase or status info. That way the EA would link and stay the same.

Tables to be deleted in new database

Tblcomservice
Tblcmsinfo
Tblequiptype
Tblequipservice
Tblmaydelete
Tblmyqueries
Tblrm12799
Tblroutes
Tblequipmenttype
Loc details
Check list
Paste errors
Purchaseorderb
Lat-long
Wireless modem location table

LOV's and new tables needed

Various LOV tables will be needed for data validation:

Need a LOV with types of cameras or TV's- i.e. CCTV

Need a table to list cities by county and routes by county. City is not required, but county is. Counties have a numeric Caltrans code and an alpha code, i.e. Alameda = '33' also 'ALA'

A new table is needed for Hub devices. Current application does not include these, but future application will need it.

Cabinet model table will be a LOV for model, table, and equipment.

A table for type of structures where signs and equipment is mounted will be provided as 'Mounted on' LOV. Poles will also have a LOV for pole material and pole height.

DISTRICT 4 SUGGESTED REQUIREMENTS:

District 4 has developed a list of Requirements that were included in a document delivered to ISSC during April 2000. These are to be considered long range goals some of which will be completed in Phase One and others to be deferred for future development.

District 4 Requirements (Copied from document delivered April 2000):

Detailed requirements will be developed during the project. ISSC and D4 project personnel will interview representatives of all prospective users to identify requirements and to establish details for each one.

- Migrate the existing TOS database to the statewide standard Oracle based DB.
- Make the database available to users via the Caltrans Intranet.
- Link the TOS database to GIS so that users can click on an icon and see information about selected field devices. If feasible, allow the GIS users to also directly access database editing forms.
- Link CADD PSE drawings (read only) to allow TOS to monitor what is finally Advertised and provided to Construction
- Link As-Built drawings (MicroStation format) to the GIS so that a user accessing the TOS database can also view drawings of the same field device installation.
- Link the TOS database to the Construction database so that a GIS database user can readily retrieve construction related information for the Expenditure Authorization (EA) for a particular field device.
- Link the TOS DB to the Office Engineers database so that a TOS DB user can readily retrieve information related to the project estimates (BEES).
- Link the TOS database to the Project Management and Control System (PMCS) database so that the TOS database user can readily access project administration information for the EA for a selected field device.
- Automate the process, by which maintenance work orders are generated by TOS equipment users, delivered to maintenance personnel, verify the response, and the actual maintenance work logged with feedback to electrical operations unit when needed.
- Automate the process by which Service Request orders are generated by TOS Electrical users, delivered to D4 IS staff for processing, verify response, and an actual request logged with feedback to electrical operations.
- Allow user access privileges (read-only, write, delete, etc.) to vary by field and to be different for different users.
- Criteria for queries, forms and reports will be developed.

TOS SYSTEM PHASE 1 REQUIREMENTS:

Requirement Number	Requirement		Comment
1.0	General		
	The system must provide a graphical user interface using Menus, buttons, list boxes, dropdowns, etc.		
	The system must provide on-line field-level edits to ensure that all required fields are completed on a screen		
	The system must provide meaningful error messages		
	The existing TOS data must be migrated to the statewide standard Oracle based DB.	data conversion	
	The system must be available to users via the Caltrans Intranet	new	
	The database must be linked to GIS so that users can click on an icon and see information about selected field Devices.	new	
	The system must allow the GIS users to directly access database editing forms.	new	???
	The system must link CADD PSE drawings (read only) to allow TOS to monitor what is finally Advertised and provided to Construction	new	Future development
	The system must link As-Built drawings (MicroStation format) to GIS so that a user accessing the TOS database can also view drawings of the same field device installation.	new	Future development
	The system must link the TOS database to the Construction database so that a GIS database user can readily retrieve construction related information for the Expenditure Authorization (EA) for a particular field device.	new	Future development
	The system must link the TOS DB to the Office Engineers database so that a TOS DB user can readily retrieve information related to the project (BEES).	new	Future development
	The system must link the TOS database to the Project Management and Control System (PMCS) database so that the TOS database user can readily access project administration information for the EA for a selected field device.	new	Future development
	The system must automate the process by which maintenance work orders are generated by TOS equipment users, delivered to maintenance personnel, verify the response, and the actual maintenance work logged with feedback to Electrical Operations unit when needed.	new	

TOS REQUIREMENTS - BUSINESS RULES

DRAFT

	The system must automate the process by which Service Request orders are generated by TOS Electrical users, delivered to D4 IS staff for processing, verify responses and an actual request logged with feedback to electrical operations.	new	
2.0	Security		
	The system must provide a security scheme that is tied to the user role	new	
	The system must provide a menu scheme that is tied to the security	new	
	The system must Control users right to read, write or update data	new	
	The system must maintain a log of data updates identifying the user, Update date, table & field	new	Future development
	The system must provide a system administration function to allow control of user rights	new	
3.0	Data Collection - Provide the ability to:		
	STORE PROJECT DATA	EDO	
	Project Details		
	Create SFM LR		
	Print Preview the Request		
	Autogenerate LR Number	New - jas	
	Display EA on LR	New - jas	
	Xref fields not needed on LR anymore	New - jas	
	Validate Project data fields		
	Store Cabinet data	EDO	
	Cabinet Details		
	Inspection		
	Contents		
	Store digital camera picture(s) of cabinet	new	
	Store picture(s) of inside of cabinet	new	
	Store Telephone Demarc. Cabinet Info		
	Store Service Cabinet Info		
	Validate Cabinet data fields		
	Store OCTV data	EDO TO	
	Facilities General Info		
	Equipment Info		
	Hub Info		
	Inspection		
	Validate OCTV data fields		
	Store CMS data	EDO TO	
	General Info		
	Inspection		
	Validate CMS data fields		
	Store EMS data	TOS	

TOS REQUIREMENTS - BUSINESS RULES

DRAFT

	Validate EMS data fields		
	Store HAR data	TOS	
	Validate HAR data fields		
	Store Ramp meter data	EDO TO	
	Validate Ramp meter data fields		
	Store Surveillance Station data	EDO	
	Facilities/Location		
	Inspection		
	170 Info		
	Sensor Info		
	Validate Surveillance Station fields		
	Store Communication data	EDO	
	Communication Service Point Info		
	CCTV Comm Info		
	ISDN Comm Service		
	CMS/HAR/EMS Comm Info		
	Surv Stations Comm Info		
	Wireless Comm Info		
	Add 'Drop' field		
	Hub Term. Info		
	Generate New Local Request		
	Print Preview the Request		
	Autogenerate LR Number	New - jas	
	On LR, Display actual EA for the project that Requested the Service	New - jas	
	Allow change to default Delivery Date	New - jas	
	Bring TDC# to printed LR	?? isn't it now	
	When return to Comm tab from creating or view LR, return back to record assoc with this LR		
	Do not migrate postmile & direction to LR	New - jas	
	Xref fields not needed on LR anymore	New - jas	
	Need to track versions and chips??	new	
	Validate Communication data fields		
	Store Maint Base data	EDO	
	Store Vehicle Detection Monitoring Station Data	TOS	
	Store TDLINKS data	TOS	
	Store history of EAs for each element	new	
	Store and validate additional data as needed		
	Update all required tables used for linking of data tabl		
	Enforce correction of invalid input data		
	LOV - Display cities within the County only		
	LOV - Display routes within County only		
4.0	Data retrieval - Provide the ability to:		
	Retrieve Cabinet data by IRM	EDO	IRM=County, Route, Po
	Retrieve Cabinet Data by identifier number	EDO	Id numbers on outside o

TOS REQUIREMENTS - BUSINESS RULES

DRAFT

	Display photos of cabinet - inside & outside		
	Retrieve data related to a Cabinet for each type of equipment (CCTV, EMS, HAR, RAMP, Surv Station)	new	
	Retrieve TD Links info	TOS	
	Search by Project & find all related elements	new	
	Display Active stations for each type of equipment	EDO	
	Display Inactive stations for each equipment type	EDO	
	Search by Project Number which is EA		
	Search Equipment by Postmile range (List)	TOS	
	Search by Element Id	New	
	Search by Element Id within range of Ids	New	
	Search by Element Id within Postmile range	New	
	Search by Group Id (within Radio Name now)	New	
	Search by Maintenance Id	TOS	
	Search by Equipment Type and Status (List)	TOS	
	Search for Elements by County and Route	New - cha	
	Search for Elements by County, Route, & Status	New - cha	
	Search for Elements by County, Route, Postmile Range & Status (maybe select 1 or more element type)	New - chan	
	Display & Update list of Operational CCTVs	TMC	
	Display & Update list of Operational CMSs	TMC	
	Display & Update list of Operational HARs	TMC	
	Display & Update list of Operational EMSs	TMC	
	Display & Update list of Operational MSs	TMC	Monitoring Stations
	Display & Update list of Operational RMs	TMC	
	Display & Update Elect Maint Equipment Status	EM	
	View SFM for Loc (View LR for Loc)	EDO	project & communication
	View SFM LR (Browse LRs)	EDO	
	View/Enter EA History (List)	RM	
	Access CADD files from PSE?	new	Future development
	Query status of project in Maintenance System	new	Future development
	Query Log file for Units and Functions	new	Future development
5.0	Updates - Provide the ability to update retrieved data:		
	Verify that user has update privileges on the data.	new	
	Verify that all changes meet edit criteria		
	Update the data in the database		
6.0	Reporting - Provide the ability to produce reports:		
	Verify that the user has the right to produce and print Reports.	New	

TOS REQUIREMENTS - BUSINESS RULES

DRAFT

	Report of Active stations for each type of equipment	EDO	
	Report of Inactive stations for each type of equipment	EDO	
	Report of TD Links Info	new	
	Report with County, Route, Postmile, direction, location, description, element type, element id, status	New - Cha	
	Fill out & Print Service Request Orders	EDO	
	Fill out & Print Maintenance Work Orders	EDO	
	Field Report Surv Stations	EDO	
	OCTV Report?	TOS	
7.0	GIS - Provide GIS capabilities for displaying data:		
	Select by latitude/longitude	new	
	Select by IRM number	new	
	Provide Icons for each type of equipment and a Legend to identify them	new	
	Store and view 'As built' plans	new	Future development
	Store and view aerial photos	new	Future development

CONCLUSION:

These are the requirements as noted from interviews between ISSC and District 4 personnel, but other requirements may be added as needed. This document is intended as a guide to be used during the development and data conversion process.

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TOS - Traffic Operations System

READ ME
TOS System
April 2002

This document is intended to further document the TOS System.

The system was developed April 2000 through April 2002 in order to facilitate the storage and retrieval of information related to the equipment, cabinets and elements used in the Traffic Operations System at District 4.

All information related to this system is stored on the K drive in folder D4_TOS_DB.

The top level folder includes a copy of FTP which can be used to move data to the server in preparation for loading it into the database. It is also used to move the application to the server to be recompiled and put onto the internet so that users can access it from anywhere in CALTRANS Intranet.

The user contacts on the project have been Raoul Montez and Judy Chen at District 4.

This production system has not been used. A copy of the District 4 Access database containing the information as of July 1, 2001 was received for conversion. The conversion of as much data as possible was completed March 2001 by Pat Woodward. The Forms for the TOS Elements are not finished.

The DBA for the production database is Alex Chan
Oscar Romero set up the Unix accounts.

The following information details the database specifics for the production database:

Host: d4atms-tos.dot.ca.gov
Database: tospod
Listener Port: 1521
My userid and password are pwoodward/pwoodward
Another account is tospod/oracle8i

The DBA for the test database is Jim Reilley

The TEST database has user_id tos
Password: oracle6i
Database: tosdevl
Server: svhqow002.dot.ca.gov
Logon to server is drts orauser

The Subdirectories in K:/D4_TOS_DB include

1. **Access Data Dictionary** contains a description of each field of the Access database. Each file contains the information for one of the tables.

2. **Data Conversion** holds the files used in doing the Conversion.

The Access data was received on a CD from District 4. It is in 'Secure' format so no retrievals or inquiries can be run against it. The Access file was exported to Excel and then saved in comma delimited format. The files were then converted to .txt and moved to the Sun server using FTP. On the Sun server SQLLOADER was run to load the tables. Any errors, bad data, missing data was corrected as much as possible, so that most of the available data was loaded. Since there was no editing on the Access database the data needed a lot of cleaning.

3. **DDLs** contains the scripts to create the database. There are scripts to create tables, indexes, constraints, sequences and to add synonyms and to grant rights.

4. **Documentation** holds all of the documentation that has been collected for this system, including this document.

5. **ODBC** this was tried but not used. This is a Microsoft solution to moving data from Access to Oracle, but since the database designs were different it did not work.

6. **Quest Software** holds Toad Software which gives a better view of the data in Oracle.

7. **Requirements** contains documentation for the requirements.

8. **Screen Prints** shows the prints of the screens in Word format. Use Print Screen button to save the screen print, then in Word use Control C to place screen in the document.

9. **Status Report** contains a status report document.

10 **TOS Forms Devl** holds the forms and reports source code and compiled versions
There are several forms in the system. TOS_main_menu is the screen that appears when a person logs on. It gives them a choice of the other the other screens. The tos_maint_form is intended for special people with admin privileges to add more items to the types of items being inventoried. That is, they update the information that is in the picklists. The tos_people form is used to add people to the database so they can be added to projects. The tos_field_elements form handles most of the process. Here is where the elements are added, updated and deleted. It consists of a number of tab pages.

11. **TOS PROC** holds some procs which were created to do maintenance on the database and to create triggers for the forms.

APPENDIX B- COST & PRICE ANALYSIS FORM

COST AND PRICE ANALYSIS - RESEARCH AND DEVELOPMENT CONTRACTS

This form is to be used in lieu of FAA Form 3515 as provided under FAPR 2-16.260-2, it will be executed and submitted with proposals in response to "Requests for Proposals," for procurement of research and development services. If your cost accounting system does not permit analysis of costs as required, contact the purchasing office for further instructions.

PURCHASE REQUEST NUMBER
ea TOS Application Development RFP
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NAME AND ADDRESS OF OFFERER

TITLE OF PROJECT

DETAIL DESCRIPTION	ESTIMATED HOURS	RATE/HOUR	TOTAL ESTIMATED COST (Dollars)
1. DIRECT LABOR(Specify)			
Phase IA			
Phase IB			
Phase IC			
TOTAL DIRECT LABOR			
2. BURDEN (Overhead-specify) Dept. or Cost Center	Burden Rate	X BASE	BURDEN (\$)
TOTAL BURDEN			
3. DIRECT MATERIAL			
TOTAL MATERIAL			
4. SPECIAL TESTING (Including field work at Government installations)			
TOTAL SPECIAL TESTING			
5. SPECIAL EQUIPMENT (If direct charge - specify in Exhibit B on reverse			
6. TRAVEL (If direct charge)			
a. TRANSPORTATION			
b. PER DIEM OR SUBSISTENCE			
TOTAL TRAVEL			
7. CONSULTANTS (Identify - purpose - rate)			
TOTAL CONSULTANTS			
8. SUBCONTRACTORS (Specify in Exhibit A on reverse)			
9. OTHER DIRECT COSTS (Specify in Exhibit B on reverse - explain royalty costs, if any)			
10. TOTAL DIRECT COST AND BURDEN			
11. GENERAL AND ADMINISTRATIVE EXPENSE (Rate % of item nos.)			
12. TOTAL ESTIMATED COST			
13. FIXED FEE OR PROFIT (State basis for amount in proposal)			
14. TOTAL ESTIMATED COST AND FIXED FEE OR PROFIT			

15. OVERHEAD RATE AND GENERAL AND ADMINISTRATIVE RATE INFORMATION				
A. GOVERNMENT AUDIT PERFORMED		DATE OF AUDIT	ACCOUNTING PERIOD COVERED	
B. NAME AND ADDRESS OF GOVERNMENT AGENCY MAKING AUDIT		C. DO YOUR CONTRACTS PROVIDE NEGOTIATED OVERHEAD RATES? () NO () YES <i>(IF YES, NAME AGENCY NEGOTIATING RATES)</i>		
D. (If no Government rates have been established, furnish the following information)				
DEPARTMENT OR COST CENTER	RATE	TOTAL INDIRECT EXPENSE POOL		BASE FOR TOTAL
16. EXHIBIT A - SUBCONTRACT COSTS (If more space needed, use blank sheets, identify item number)				
NAME AND ADDRESS OF SUBCONTRACTOR(S)	SUBCONTRACTED WORK	SUBCONTRACT		
		TYPE	AMOUNT	
TOTAL				
17. EXHIBIT B - OTHER DIRECT COSTS (If more space needed, use blank sheets, identify item number)				
TOTAL				
CERTIFICATE				
<p>The labor rates and the overhead costs are current and other estimated costs have been determined by generally accepted accounting principles. Bidder represents: (a) that he__has, __has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure his contract, and (b) that he__has, __has not, paid or agreed to pay to any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract, and agrees to furnish information relating to (a) and (b) above, as requested by the Contracting Officer.</p> <p><i>For interpretation of the representation including the term "bona fide employee," see Code of Federal Regulations, Title 44, Part 150.</i></p>				
NO. OF CONTRACTOR EMPLOYEES: <input type="checkbox"/> 500 AND UNDER <input type="checkbox"/> OVER 500 <input type="checkbox"/> OVER 750 <input type="checkbox"/> OVER 1,000			STATE INCORPORATED IN: 	
DATE		SIGNATURE AND TITLE OF AUTHORIZED REPRESENTATIVE OF CONTRACTOR		

APPENDIX C- CALIFORNIA LEVINE ACT STATEMENT

California Government Code § 84308, commonly referred to as the “Levine Act,” precludes an officer of a local government agency from participating in the award of a contract if he or she receives any political contributions totaling more than \$250 in the 12 months preceding the pendency of the contract award, and for three months following the final decision, from the person or company awarded the contract. This prohibition applies to contributions to the officer, or received by the officer on behalf of any other officer, or on behalf of any candidate for office or on behalf of any committee.

The Metropolitan Transportation Commission (“MTC”) commissioners include:

Tom Ammiano	Scott Haggerty	Jon Rubin
Tom Azumbrado	Barbara Kaufman	Bijan Sartipi
James T. Beall, Jr.	Steve Kinsey	James P. Spering
Irma J. Anderson	Sue Lempert	Pamela Torliatt
Mark DeSaulnier	John McLemore	Sharon Wright
Bill Dodd	Michael D. Nevin	Shelia Young
Dorene M. Giacomini		

1. Have you or your company, or any agent on behalf of you or your company, made any political contributions of more than \$250 to any BATA commissioner or GGBHTD director in the 12 months preceding the date of the issuance of this request for qualifications?

☐ YES ☐ NO

If yes, please identify the commissioner or director:

2. Do you or your company, or any agency on behalf of you or your company, anticipate or plan to make any political contributions of more than \$250 to any BATA commissioner or GGBHTD director in the three months following the award of the contract?

☐ YES ☐ NO

If yes, please identify the commissioner or director:

Answering yes to either of the two questions above does not preclude BATA from awarding a contract to your firm. It does, however, preclude the identified commissioner(s) from participating in the contract award process for this contract.

DATE

(SIGNATURE OF AUTHORIZED OFFICIAL)

(TYPE OR WRITE APPROPRIATE NAME, TITLE)

(TYPE OR WRITE NAME OF COMPANY)

APPENDIX D- SYNOPSIS OF PROVISIONS IN MTC SAFE'S STANDARD CONSULTANT AGREEMENT

In order to provide proposers with an understanding of some of MTC SAFE's standard contract provisions, the following is a synopsis of the major requirements in the standard agreement for professional services. A copy of MTC SAFE's standard agreement may be obtained from the Contract Manager.

Termination: MTC SAFE may, at any time, terminate the Agreement upon written notice to Consultant. Upon termination, MTC SAFE will reimburse the Consultant for its costs for incomplete deliverables up to the date of termination. Upon payment, MTC SAFE will be under no further obligation to the Consultant. If the Consultant fails to perform as specified in the agreement, MTC SAFE may terminate the agreement for default by written notice, and the Consultant is then entitled only to compensation for costs incurred for work products acceptable to MTC SAFE, less the costs to MTC SAFE of re-bidding.

Insurance Requirement: Consultant agrees to obtain and maintain at your own expense the following types of insurance for the duration of this agreement: (1) Worker's Compensation Insurance, as required by the law, and Employer's Liability Insurance in an amount no less than \$1,000,000; (2) Commercial General Liability Insurance with a combined single limit of not less than \$1,000,000 for injury to any one person and for any one occurrence and \$2,000,000 general aggregate applying separately to this project; (3) Automobile Liability Insurance in an amount no less than \$1,000,000; and (4) Errors and Omissions Insurance in the amount of \$1,000,000. The Commercial General Liability Insurance policy shall contain an endorsement to include MTC SAFE, Caltrans, and their Commissioners, Directors, officers, representatives, agents and employees as additional insureds and to specify that such insurance is primary and that no MTC SAFE or Caltrans insurance will be called on to contribute to a loss. Certificates of insurance verifying the coverages and the required endorsements and signed by an authorized representative of the insurer must be delivered to MTC SAFE prior to issuance of any payment under the Agreement by MTC SAFE.

Independent Contractor: Consultant is an independent contractor and has no authority to contract or enter into any other agreement in the name of MTC SAFE. Consultant shall be fully responsible for all matters relating to payment of its employees including compliance with taxes.

Indemnification: Consultant agrees to defend, indemnify and hold MTC SAFE and Caltrans harmless from all claims, damages, liability, and expenses resulting from any act or omission of Consultant in connection with the agreement. Consultant agrees to defend any and all claims, lawsuits or other legal proceedings brought against MTC SAFE and/or Caltrans arising out of Consultant's acts or omissions. The Consultant shall pay the full cost of the defense and any resulting judgments.

Data Furnished by MTC SAFE or Caltrans: All data, reports, surveys, studies, drawings, software (object or source code), electronic databases, and any other information, documents or materials made available to the Consultant by MTC SAFE or Caltrans for use by the Consultant in the performance of its services under this Agreement shall remain the property of MTC SAFE or Caltrans, as applicable, and shall be returned to MTC SAFE or Caltrans at the completion or termination of this Agreement. No license to such MTC SAFE or Caltrans Data, outside of the Scope of Work of the Project, is conferred or implied by the Consultant's use or possession of such MTC SAFE or Caltrans Data. Any updates, revisions, additions or enhancements to such MTC SAFE or Caltrans Data made by the Consultant in the context of the Project shall be the property of MTC SAFE or Caltrans, as applicable.

Ownership of Work Product: All data, reports, surveys, studies, drawings, software (object or source code), electronic databases, and any other information, documents or materials ("Work Product") written or produced by the Consultant under this Agreement and provided to MTC SAFE as a deliverable shall be the joint property of MTC SAFE and Caltrans. Consultant will be required to assign all rights in copyright to such Work Product to MTC SAFE and Caltrans.

Personnel and Level of Effort: Personnel assigned to this Project and the estimated number of hours to be supplied by each will be specified in an attachment to the Agreement. No substitution of personnel or substantial decrease of hours will be allowed without prior written approval of MTC SAFE.

Subcontracts: No subcontracting of any or all of the services to be provided by Consultant shall be allowed without prior written approval of MTC SAFE. MTC SAFE is under no obligation to any subcontractors.

Consultant's Records: Consultant shall keep complete and accurate books, records, accounts and any and all work products, materials, and other data relevant to its performance under this Agreement. All such records shall be available to MTC SAFE or Caltrans for inspection and auditing purposes. The records shall be retained by Consultant for a period of not less than four (4) years following the fiscal year of the last expenditure under this Agreement.

Prohibited Interest: No member, officer or employee of MTC SAFE can have any interest in this agreement or its proceeds and Consultant may not have any interest which conflicts with its performance under this Agreement.

Governing Law. The agreement shall be governed by the laws of the State of California.